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1. *Ramalina rigida.* 3. *Ramalina* spores.
2. *Ramalina Duriaei.* 4. *Ramalina pusilla.*
5. *Ramalina usnea.*

Cortical layer 20–60 μ thick. Hyphae 2–9 μ in diameter. Gonidia 5–17 μ in diameter.

Plate VII

1. The Acharian type of *Ramalina homalea* at Helsingfors. (Slightly reduced.)
2. The Nylander type of *Ramalina testudinaria* at Paris. (Nat. Size.)
3. The Acharian type of *Parmelia ceruchis* at Helsingfors. (Slightly reduced.)
4. The Nylander type of *Ramalina combeoides* at Helsingfors. (Nat. Size.)
5. The Howe type of *Ramalina combeoides* var *robusta* at Washington. (Slightly reduced.)
6. The Müller Arg. type of *Ramalina testudinaria* var. *intermedia* at Chambésy. (Nat. size.)
7. The Müller Arg. type of *Ramalina testudinaria* var. *humilis* at Chambésy. (Nat. size.)

NOTES ON NORTH AMERICAN SPHAGNUM. V (Concluded)

A. LeRoy Andrews

11. *Sphagnum teres* (Schimper) Ångström, 1861. This type, distinguished as a variety of the one next following by Schimper in 1858, was regarded by Ångström as a separate species and bryologists have wavered between the two opinions ever since. While inclined from my own experience to separate the two specifically I realize fully their very close relationship. Warnstorf once inverted the relation of the two, making the following a variety of this species.[1] This procedure while nomenclatorially reprehensible was probably based upon a correct feeling for phylogenetic relationships. The two are most readily distinguished from other species of *Litophloea* by their large stem-leaves of elongated lingulate shape with broad and short hyaline cells without fibrils and with extensive membrane-resorption on outer surface, the total effect being well represented by Roth's figures already referred to. Of the two *S. teres* is the more likely to be confused with other species, as in the field it looks not unlike such species as *S. Girgensohnii* or even *S. recurvum*, a fact obviously not without phylogenetic significance. These three species can however be readily distinguished in the wet state by an examination of the stem-leaves with a hand-lens and like all Sphagna are more easily distinguished when dry. Lindberg was the first to note[2] that the inner walls of the hyaline leaf-cells where overlying the chlorophyll cells are in both *S. teres* and *S. squarrosum* usually minutely papillose. The two species are separated from each other by quantitative macroscopic differences: the greater size of the plants and of some of their parts in *S. squarrosum* and the usually strongly squarrose branch-leaves of the latter species, its individual branch-leaves being then ovate-hastate while those of *S.*

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[1] Die europäischen Torfmoose 121. 1881.

[2] Cf. Braithwaite, Sphagnaceae 62f. 1880.

teres are normally ovate-lanceolate. The pores in the branch-leaves of *S. teres* are usually fewer and larger in proportion to the size of the cells, and there are other minor differences. Somewhat intermediate forms cause difficulty however. Lesquereux described in 1868 a *S. squarrosulum* from California[1] which has by most botanists been treated as a variety (form) of *S. teres*, rightly so I should say from an examination of the original California specimens, though I have also seen small specimens of *S. squarrosum* determined by botanists as *S. teres* var. *squarrosulum*. In fact I am inclined to think that *S. squarrosum* under the influence of unfavorable local, seasonal, or other circumstances reverts to a type not easily separable from forms of *S. teres*.[2] I note that a Hungarian bryologist, Péterfi, still retains *S. squarrosulum* as an independent species,[3] but the porose stem-cortex which, if I understand aright, characterizes his only specimen is quite abnormal for this group, nor do I find it present in our specimens of this form. Warnstorf emphasized a "biologic" point as separating *S. teres* and *S. squarrosum*:[4] that *S. teres* (excepting its variety *squarrosulum!*) prefers open moors, while *S. squarrosum* is found in shady places and at most along the edges of swamps. The case is not dissimilar in North America, *S. teres* being found often in widely extended masses in bogs or wet meadows at the bases of mountains, etc., while *S. squarrosum* occurs commonly in irregular clumps in more varied environment. I do not know however that the matter can be formulated into anything like an absolute rule. *S. teres* is often strongly pigmented brown. It is, so far as observed, dioicous and does not commonly fruit. Its distribution is quite similar to that of *S. squarrosum*, reaching high latitudes in Greenland, Labrador and Alaska and extending south to something like the southern limits of glaciation, its southern limits as at present known extending through New Jersey, New York, Michigan, Colorado, California. Further collections fixing its southern limits more accurately are especially desirable. Its range in Europe and Asia appears to be similar.

12. *Sphagnum squarrosum* Crome, 1803. The date of publication (1800) of this species given by Warnstorf and others seems to be doubly wrong in that the number of the periodical in question did not appear until 1801 and that the reference shows only a *nomen nudum* without description. A good description and figure was given in 1804 by Weber and Mohr,[5] the authors again ascribing the species to Persoon. An adequate description appears however to have been published the year before by Crome in connection with a set of moss-exsiccati.[6] So far as I know Crome did not ascribe the species to Persoon.

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[1] Lesquereux's name had been applied earlier to European specimens, but without published description.

[2] Cf. also Loeske, Zur Morphologie und Systematik der Laubmoose 45. 1910.

[3] Péterfi Márton, Magyarország Tözegmohai: Különlenyomat a "Növénytani Közlemények." 1904. 150.

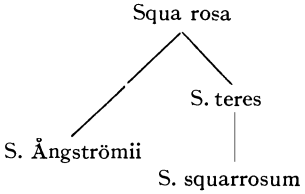
[4] Kryptogamenflora der Mark Brandenburg, **1**: 350. 1903.

[5] Naturh. Reise durch einen Teil Schwedens 129, pl. 2, fig. 1 ab.

[6] Cf. Dusén, Om Sphagnaceernas Utbredning 26. 1887; Lindberg, Europas och Nord Amerikas Hvitmossor 43. 1882; Botanische Zeitung **2**: 321 ff. 1803.

This species is the one most easily recognized by beginners, thanks to its large size and usually very squarrose branch-leaves, and should in fact if normally developed be confused with no other. Its other characters have already been sufficiently dwelt upon. An interesting fact long since noted[1] is that corresponding to its robustness the cortex of the branches usually includes a second layer of empty cells (complete or partially developed). In contrast to the last species *S. squarrosum* is generally monoicous and fruits commonly and abundantly. Its distribution is essentially that of *S. teres*, but it is decidedly more common in the southern part of its range. Its present southern limit crosses the states: New Jersey, Pennsylvania, Ohio, Michigan, Wisconsin, Minnesota, Colorado, California.

As to phylogenetic relationship there remains not much to be said. Our results could be represented thus:



With reference to *Malacosphagnum* Dr. J. H. Barnhart has called my attention to the fact that *S. strictum* Sullivant should be dated a year earlier, as Sullivant's collection of exsiccati (with descriptions of new species) was published the year before the appearance of the pamphlet with descriptions, i. e. in 1845.[2] It may also be of interest to note a collection of this species in Norway earlier than previously reported. Reference by Dusén[3] to a specimen collected by Wulfsberg (in 1874) on the island of Halsenö off the western coast of Norway and named by him *S. squarrosulum* which Dusén asserted was *S. compactum* led me to suspect *S. strictum*. Herr Kaalaas has very kindly looked up the specimen in the herbarium of Kristiania University, confirming my suspicion. A portion of the specimen sent me shows characteristic fruiting specimens of *S. strictum* Sullivant.

ITHACA, N. Y.

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[1] Cf. already Schimper, Mém. Sphaign. and Vers. Torfm., pl. XVII, fig. 12. 1857, 1858.

[2] Cf. Amer. Journ. Sci. and Arts, 2d Series, I, 70. 1846.

[3] Om Sphagnaceernas Utbredning 79. 1887.